

COVID-19 induced severe respiratory failure in early gestation with favourable outcome: A close escape

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ABSTRACT

A small percentage of pregnant females suffer from respiratory failure during the course of their pregnancy which amounts to about 2 percent of all pregnancies. Usually the cause for this respiratory failure remains pre eclampsia or amniotic fluid embolism. However, with the ongoing pandemic, an emerging cause of respiratory failure is Infection with Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV 2). Chest wall compliance is decreased in pregnancy hence making it further difficult to fight COVID-19. We present a case of 31 year old pregnant female with gestational age of 28 weeks who presented with acute respiratory failure with severe hypoxia due to COVID-19. She was treated with non invasive ventilation, remdesavir, steroids and other supportive measures. She was given incentive spirometry and her oxygen saturation improved drastically. Ultimately she was shifted on high flow oxygen and was discharged in stable condition making it a close escape. Thus we showcase the importance of diagnosing COVID-19 induced respiratory failure early and the substantial role of incentive spirometry in COVID-19 which is an underrated aspect of chest rehabilitation during the ongoing pandemic.

Keywords: COVID-19, Pregnancy, Respiratory Failure

1. INTRODUCTION

In late 2019 Wuhan, China witnessed the first ever case of COVID-19. Unexpected turn of events took place since then and there has been a widespread pandemic causing a great amount of mortality. Pregnant females are vulnerable to respiratory diseases due to the respiratory changes witnessed during pregnancy along with immunomodulation. The severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) functions by modulating the expression of angiotensin convertase enzyme 2 (ACE 2) gene in humans (Lai et al., 2020). Since the amount of ACE2 receptors are increased in pregnancy there is increased risk of contracting COVID-19 during pregnancy. However the reporting of COVID-19 in pregnancy has been predominantly in the term pregnancy. This is due to increase in ACE 2 receptors in term



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placenta (Hoque et al., 2020). COVID-19 may lead to fetal growth restriction or fetal demise leading to increase in mortality and morbidity. Thus there is need of early detection of COVID-19 in pregnant females to prevent adverse outcomes in such cases. In this case report we highlight a 31 year old female who presented in early gestation with acute onset dyspnea and hypoxia and was tested positive for COVID-19. She was managed with non invasive ventilation with high pressure along with other supportive measures and was provided incentive spirometry to improve her lung functions.

2. CASE REPORT

A 31 year old pregnant female with gestational age of 28 weeks presented to the emergency department with acute onset dyspnea since 6 hours. There was history of high grade fever with chills since 3 days which was subsided by antipyretics. There was no history of bronchial asthma, hypertension, diabetes mellitus, tuberculosis, thyroid disorder or any other chronic medical illness. On examination pulse was 122 beats per minute regular, blood pressure was 130/88 mmhg in right arm sitting position, spo2 was 76 percent on room air and respiratory rate was 38 breaths per minute. On systemic examination there were bilateral bronchial breath sounds in the mammary and infra mammary region, uterus was 28 weeks in size, relaxed and fetal hear sound were heard, normal, 140 beats per minute, heart sounds were normal and patient was conscious and oriented.

Patient was immediately admitted in intensive care unit and was taken on non invasive ventilation. Chest X ray was suggestive bilateral pneumonia (Figure 1). Nasopharyngeal swab for COVID-19 was done and was positive. Lab investigations showed White blood cell count of 14200/dl, D-dimer 1.34, CRP 77mg/dl and serum ferritin 680mg/dl. Arterial Blood Gas analysis was suggestive of type 1 respiratory failure with pH of 7.32, PaO2 of 52mmhg and PaCO2 of 47mm hg. Rest of the lab investigations were within normal range (table 1). Patient was started on remdesavir in view of risk benefit ratio along with steroids and other supportive measures. As the patient improved she was shifted to high flow oxygen on day 17 of admission (Figure 2). She was provided with incentive spirometry daily (figure 3) and her oxygen saturation kept on improving with decreasing hypoxia. On day 29 of admission she was shifted to room air and was ultimately discharged on day 41 of admission. Fetal heart rates were monitored throughout her admission and were normal.

Table 1 Showing Lab Investigations

CBC	Hb-10.6gm/dl MCV-93fl Platelet count-129000/dl WBC Count-14200/dl
LFT	Total Protein-6.9gm/dl, Albumin3.5gm/dl, Globulin3.4gm/dl, aspartate aminotransferase 22units/l , alanine aminotransferase 31 units/l, AlkanlinePhophatase105IU/l, Total Bilirubin :1.07mg/
KFT	Creatinine:0.98mg/dl, Urea 29mg/dl, Sodium134mmol/l, Potassium -3.8mmol/l
CRP	77.0mg/dl
D-Dimer	1.34
Serum Ferritin	680ng/ml



Figure 1 Chest X ray showing bilateral infiltration



Figure 2 Day 17 of admission when the patient was shifted on high flow oxygen in the intensive care unit



Figure 3 Showing the patient practicing incentive spirometry

3. DISCUSSION

Angiotensin convertase enzyme is a crucial enzyme of the renin angiotensin system. ACE 2 is highly expressed in pregnancy in the uterus, placenta and other reproductive organs as it is essential for proper fetal growth. However, this ACE2 is an entry node for the severe acute respiratory syndrome coronavirus 2. Increased expression of ACE 2 in fetal tissues might facilitate vertical transmission of COVID-19 and may also be the reason behind increasing morbidity and mortality in COVID-19 patients (Breslin et al., 2020). Increased levels of angiotensinogen after 20 weeks of gestation leads to pre eclampsia. Furthermore, there is a compensatory upregulation of ACE 2 receptors due to increased blood pressure to increase vasodilation. ACE 2 also plays a vital role in fetal brain in lung development. Thus, although important ACE 2 plays an important role in facilitating COVID-19 infection amongst pregnant females.

Respiratory changes during pregnancy might make it difficult for patients to compensate for the respiratory distress caused by COVID-19. Due to abdominal distention there is upward pushing of the diaphragm further worsening the respiratory distress. Hormonal changes observed during pregnancy lead to airway edema and hyperemia. Total lung capacity in pregnancy might decrease minimally but this small amount of change might be crucial in respiratory distress caused due to COVID-19 (figure 4).

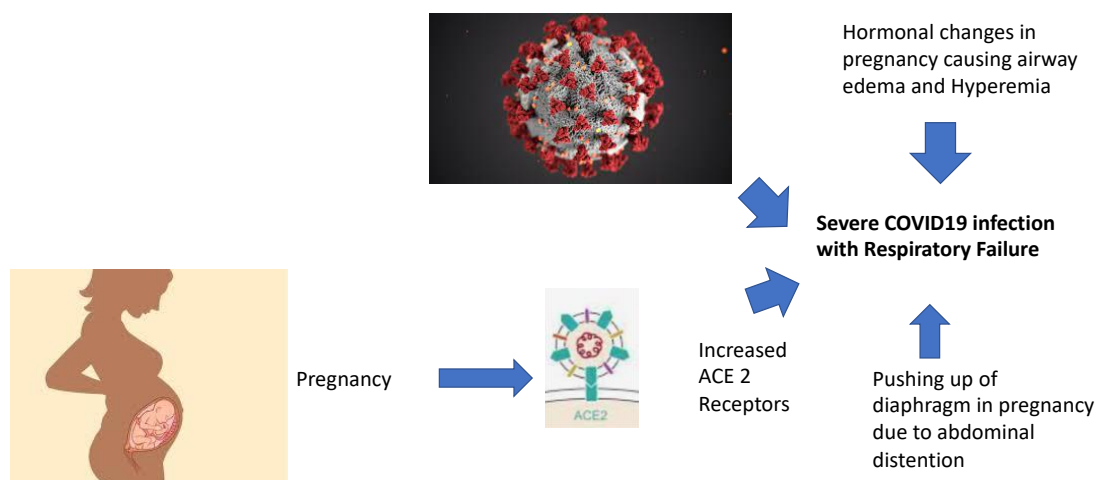


Figure 4 showing pathophysiology of respiratory failure in pregnancy with COVID-19

Chest X ray of our patient had infiltration which was more profound in the lower and middle zone of the lung which is characteristic of COVID-19 (Jain et al., 2020). Our patient was treated with remdesavir, steroids and other supportive measures.

Steroids form a mainstay of treatment for respiratory distress caused by COVID-19 (Talwar et al., 2021). It is important to note that incentive spirometry played a vital role in treatment of our patient. Incentive spirometry leads to a decreasing mismatch of ventilation and perfusion by providing a splint and preventing alveolar collapse. This is an important pillar of managing COVID-19 which is often forgotten. In the earlier stages of pandemic it was believed that incentive spirometer might be harmful by causing self inflicted lung injury however our patient benefited profoundly by this simple yet effective member of pulmonary rehabilitation. With decreased respiratory compliance in Pregnancy, this might act like a game changer for increasing lung functions like In our case (Ryea et al., 2020).

4. CONCLUSION

Thus, we conclude that early diagnosis in COVID 19 in pregnancy is essential to prevent maternal mortality. Use of non invasive ventilation, antiviral, steroids and incentive spirometry helped to provide a favorable outcome in our case with a healthy fetus and mother on discharge. We also highlight that a small practice like incentive spirometry might be a game changer while managing respiratory failure due to COVID-19 and hence it should be a part of treatment protocol in health care facilities battling COVID-19.

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Conflict of interest

The Authors have no conflicts of interest that are directly relevant to the content of this clinic-pathological case

Financial Resources

There are no financial resources to fund this study

Informed Consent

Informed Consent was obtained from the patient.

Author's Contribution

All the authors contributed equally to the case report.

Data and materials availability

All data associated with this study are present in the paper.

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